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(54) **Client-server based speech recognition**

Client-Server-Spracherkennungssystem

Reconnaissance de la parole basée sur un modèle client-serveur

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EP 1 085 501 B1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a speech input terminal, speech recognition apparatus, speech communication system, and speech communication method, which are used to transmit speech data through a communication network and execute speech recognition.

BACKGROUND OF THE INVENTION

[0002] A speech communication system is proposed, in which speech data is sent from a speech input terminal such as a portable telephone to a host server through a communication network, and processing for retrieval of specific information and the like are executed. In such a speech communication system, since data can be transmitted/received by speech, operation can be facilitated.

[0003] However, speech data fluctuate depending on the characteristics of a speech input terminal such as a portable telephone itself, the surrounding environment, and the like, and hence satisfactory speech recognition may not be performed.

[0004] In addition, since communication is performed under the same communication conditions under any circumstances, high communication efficiency cannot always be ensured.

[0005] GB-A-2323694 discloses a speech to text conversion system that has a plurality of user terminals which are connected to a remote server over communication links. The terminals are operable to transmit data identifying the user or terminal which a speech recognition apparatus in the server uses to control a speech recognition processing performed.

[0006] US-A-5553119 describes a speech communication system having a speech input terminal and a speech recognition apparatus which can communicate with each other through a communication network. The speech recognition apparatus is operable to make an automated oral query or prompt to solicit a user to respond, which response can then be analysed to select an appropriate recognition model for speech recognition purposes.

[0007] WO 99/21172 discusses a distributed pattern recognition system (for example a speech recognition system) which has at least one user station and a server station connected via a network. The server station comprises different recognition models. As part of a recognition enrolment, the user station transfers model improvement data associated with a user of the user station to the server station. The server station selects a recognition model from the different recognition models in dependence on the model improvement data.

[0008] According to one aspect the present invention provides a speech input terminal for transmitting speech data to a speech recognition apparatus through: a wire or wireless communication network, comprising:

speech receiving means for receiving speech data from speech input means;

creating means for creating a model based on information that represents an operation environment, the model being for environment adaptation for speech recognition in said speech recognition apparatus;

means for quantizing the speech data using a quantization table received from said speech recognition apparatus; and

communication means for transmitting the model and the quantized speech data to said speech recognition apparatus.

[0009] According to another aspect, the present invention provides a speech recognition apparatus characterised by comprising:

Speech recognition means for executing speech recognition processing of speech data transmitted from a speech input terminal through a wire or wireless communication network; and

means for receiving a model for environment adaptation for the speech recognition, the model being created by the speech input terminal based on information representing an operation environment thereof,

wherein said speech recognition means is operable to execute speech recognition processing on the basis of the received model,
said apparatus further comprising:

means for creating a quantization table based on the received model; and

means for transmitting the quantization table to said speech input terminal.

[0010] Corresponding speech communication methods are also provided.

[0011] Other features and advantages of the present invention will be apparent from the following description taken in conjunction with the accompanying drawings, in which like reference characters designate the same or similar parts throughout the figures thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

Fig. 1 is a block diagram showing the arrangement of a speech communication system according to an embodiment of the present invention; and
Fig. 2 is a flow chart showing the processing performed by the speech communication system according to the embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0013] Preferred embodiments of the present invention will now be described in detail in accordance with the accompanying drawings.

[0014] Fig. 1 is a block diagram showing the arrangement of a speech communication system according to an embodiment of the present invention.

[0015] The speech communication system is comprised of a portable terminal 100 serving as a speech input terminal, a main body 200 serving as a speech recognition apparatus, and a communication line 300 for connecting these components to allow them to communicate with each other.

[0016] The portable terminal 100 includes an input/output unit 101 for inputting/outputting speech, a communication control unit 102 for executing communication processing with the main body 200, an acoustic processing unit 103 for performing acoustic processing for the input speech, an environment information creation unit 104 for creating information unique to the portable terminal 100 or information indicating its operation state (to be referred to as environment information hereinafter in this embodiment), and a speech communication information creation unit 105.

[0017] The main body 200 includes an environment adaptation unit 201 for performing processing based on the environment information of the portable terminal 100, a communication control unit 202 for executing communication processing with the portable terminal 100, a speech recognition unit 203 for executing speech recognition processing for speech data from the portable terminal 100, a speech communication information creation unit 204 for setting data conversion conditions for communication, a speech recognition model holding unit 205, and an application 206.

[0018] The sequence of-operation of the speech communication system having the above arrangement will be described next with reference to Fig. 2. Fig. 2 is a flow chart showing the processing performed by the speech communication system.

[0019] The processing performed by the speech communication system is constituted by an initialization mode of analyzing environment information and a speech recognition mode of communicating speech data.

[0020] In step S401, all processes are started. Information for the start of processing is sent from the input/output unit 101 to the communication control unit 202 of the main body 200 through the communication control unit 102.

[0021] In step S402, a message is selectively sent from the speech recognition unit 203 or application 206 to the portable terminal 100. When, for example, supervised speaker adaptation based on environment information is to be performed, a list of contents to be read aloud by a user is sent and output as a message (speech or characters) from the input/output unit 101 of the portable terminal 100. When microphone adaptation based on environment information is to be performed, information for prompting the utterance of speech for a few seconds may be output as a message from the input/output unit 101 of the portable terminal 100. On the other hand, when noise adaptation based on environment information is to be performed, step S402 may be skipped.

[0022] In step S403, speech data (containing noise) is entered from the input/output unit 101 to create environment information in the portable terminal 100.

[0023] In step S404, the acoustic processing unit 103 acoustically analyzes the entered speech data. If the environment information is to be converted into a model (average, variance, or phonemic model), the information is sent to the environment information creation unit 104. Otherwise, the acoustic analysis result is sent from the communication control unit 102 to the main body. Note that the speech data may be directly sent without performing any acoustic analysis to the main body to be subjected to analysis and the like on the main body 200 side.

[0024] When the environment information is converted into a model in step S404, the flow advances to step S405 to cause the environment information creation unit 104 to create environment information. For the purpose of noise adaptation, for example, environment information is created by detecting a non-speech interval and obtaining the average and variance of parameters in the interval. For the purpose of microphone adaptation, environment information is created by obtaining the average and variance of parameters in a speech interval. For the purpose of speaker adaptation, a phonemic model or the like is created.

[0025] In step S406, the created environment information model, acoustic analysis result, or speech is sent from the communication control unit 102 to the main body 200.

[0026] In step S407, the main body 200 receives the sent environment information through the communication control unit 202.

[0027] In step S408, the environment adaptation unit 201 performs environment adaptation with respect to a speech recognition model in the speech recognition model holding unit 205 on the basis of the environment information to update the speech recognition model into an environment adaptation speech recognition model. This model is then held by the speech recognition model holding unit 205.

[0028] As a method for environment adaptation, for example, a PMC technique can be used, which creates an environment adaptation speech recognition model from

a noise model and speech recognition model. In the case of microphone adaptation, for example, a CMS technique can be used, which creates an environment adaptive speech recognition model by using the average of speech for adaptation and a speech recognition model.

[0029] In the case of speaker adaptation, for example, a method of creating a speaker adaptation model by using a speaker adaptation model and speech recognition model can be used. If a speech or acoustic analysis result is sent instead of an environment information model, a method of converting environment information into a model and further performing adaptation on the main body 200 side can be used. Alternatively, a method of performing environment adaptation by directly using a speech or acoustic analysis result, EM learning technique, VFS speaker adaptation technique, or the like can be used as an environment adaptation method. Creating an environment adaptive speech recognition model can improve recognition performance.

[0030] Obviously, a speech recognition model may be created on the portable terminal 100 side and sent to the main body 200 to be used.

[0031] In step S409, in order to improve the communication efficiency of speech recognition, the speech communication information creation unit 204 performs environment adaptation for a table for the creation of communication speech information. A method of creating a scalar quantization table of parameters of the respective dimensions which are used for speech recognition by using the distribution of environment adaptive speech recognition models will be described below. As this method, various methods can be used. The simplest method is a method of searching 3σ of the respective dimensions for the maximum and minimum values, and dividing the interval therebetween into equal portions.

[0032] The number of quantization points may be decreased by a method of merging all distributions into one distribution, searching 3σ (e.g., a range in which most of samples appearing in a Gauss distribution are included) for the maximum and minimum values, and dividing the interval therebetween into equal portions.

[0033] As a more precise method, for example, a method of assigning quantization points in accordance with the bias of all distributions may be used. In this method, since a scalar quantization table of the respective dimensions is created by using the distribution of environment adaptive speech recognition models, the bit rate for communication can be decreased without degrading the recognition performance, thus allowing efficient communication.

[0034] In step S410, the created scalar quantization table is transmitted to the portable terminal 100.

[0035] In step 411, the created scalar quantization table is received by the portable terminal 100 and stored in the speech communication information creation unit 105.

[0036] With the above operation, the initialization mode is terminated. If a plurality of portable terminals 100 are present, the main body 200 can store data such as environment information, speech recognition models, and quantization tables in units of portable terminals.

[0037] The flow then shifts to the speech recognition mode.

[0038] In step S412, speech is input through the input/output unit 101.

[0039] In step S413, the input speech data is acoustically analyzed by the acoustic processing unit 103, and the resultant data is sent to the speech communication information creation unit 105.

[0040] In step S414, the speech communication information creation unit 105 performs scalar quantization of the acoustic analysis result on the speech data by using a scalar quantization table, and encodes the data as speech communication information. The encoded speech data is transmitted to the main body 200 through the communication control unit 102.

[0041] In step S415, the main body 200 causes the speech recognition unit 203 to decode the received speech data, execute speech recognition processing, and output the recognition result. Obviously, in this speech recognition processing, the previously created speech recognition model is used.

[0042] In step S416, the speech recognition result is interpreted by the application 206 to obtain an application corresponding to the result, and the application result is sent to the communication control unit 202.

[0043] In step S417, the application result is sent to the portable terminal 100 through the communication control unit 202 of the main body 200.

[0044] In step S418, the portable terminal 100 receives the application result through the communication control unit 102.

[0045] In step S419, the portable terminal 100 outputs the application result from the input/output unit 101. When speech recognition is to be continued, the flow returns to step S412.

[0046] In step S420, the communication is terminated.

[0047] As described above, in the speech communication system of this embodiment, since speech recognition is performed by using a speech recognition model that adapts to the environment information of the portable terminal 100, optimal speech recognition can be executed in correspondence with each portable terminal. In addition, since communication conditions are set on the basis of environment information, communication efficiency can be improved in correspondence with each portable terminal.

[0048] In this embodiment, in the case of noise, the average and variance of parameters in a noise interval are obtained and sent to the main body to perform noise adaptation of a speech recognition model by the PMC technique. Obviously, however, another noise adaptation method can be used.

[0049] With regards to microphone characteristics, this embodiment has exemplified the method of obtaining the average and variance of parameters in a speech interval

of a certain duration, sending them to the main body, and performing microphone characteristic adaptation of a speech recognition model by the CMS technique. Obviously, however, another microphone characteristic adaptation method can be used.

[0050] This embodiment has exemplified the speaker adaptation method of creating a simple phonemic model representing user's speech features in advance, sending it to the main body, and performing speaker adaptation of a speech recognition model.

[0051] In this embodiment, noise adaptation, microphone adaptation, and speaker adaptation are described independently. However, they can be properly combined and used.

[0052] In this embodiment, the initialization mode is to be performed before the speech recognition mode. Once the initialization mode is completed, however, speech recognition can be resumed from the speech recognition mode under the same environment. In this case, the previous environment information is stored on the portable terminal 100 side, and environment information created in resuming speech recognition is compared with the stored information. If no change is detected, the corresponding notification is sent to the main body 200, or the main body 200 performs such determination on the basis of the sent environment information, thus executing speech recognition.

[0053] In this embodiment, environment information is used for both speech recognition processing and an improvement in speech efficiency. Obviously, however, only one of these operations may be executed by using the environment information.

[0054] Although the preferred embodiment of the present invention has been described above, the objects of the present invention are also achieved by supplying a storage medium, which records a program code of a software program that can realize the functions of the above-mentioned embodiments to the system or apparatus, and reading out and executing the program code stored in the storage medium by a computer (or a CPU or MPU) of the system or apparatus. In this case, the program code itself read out from the storage medium realizes the functions of the above-mentioned embodiments, and the storage medium which stores the program code constitutes the present invention. The functions of the above-mentioned embodiments may be realized not only by executing the readout program code by the computer but also by some or all of actual processing operations executed by an OS (operating system) running on the computer on the basis of an instruction of the program code.

[0055] Furthermore, the functions of the above-mentioned embodiments may be realized by some or all of actual processing operations executed by a CPU or the like arranged in a function extension board or a function extension unit, which is inserted in or connected to the computer, after the program code read out from the storage medium is written in a memory of the extension board or unit.

[0056] As many apparent widely different embodiments of the present invention can be made without departing from the scope thereof, it is to be understood that the invention is not limited to the specific embodiments thereof except as defined in the claims.

Claims

1. A speech input terminal (100) for transmitting speech data to a speech recognition apparatus (200) through a wire or wireless communication network (300), comprising:

speech receiving means (103) for receiving speech data from speech input means (101);
creating means (104) for creating a model based on information that represents an operation environment, the model being for environment adaptation for speech recognition in said speech recognition apparatus (200);
means (105) for quantizing the speech data using a quantization table received from said speech recognition apparatus (200); and
communication means for transmitting the model and the quantized speech data to said speech recognition apparatus (200).

2. A speech recognition apparatus (200) comprising:

speech recognition means (203) for executing speech recognition processing of speech data transmitted from a speech input terminal (100) through a wire or wireless communication network (300); and
means (202) for receiving a model for environment adaptation for the speech recognition, the model being created by the speech input terminal (100) based on information representing an operation environment thereof,

wherein said speech recognition means (203) is operable to execute speech recognition processing on the basis of the received model,
said apparatus (200) further comprising:

means (204) for creating a quantization table based on the received model; and
means (202) for transmitting the quantization table to said speech input terminal (100).

3. The apparatus according to claim 2, further comprising means for storing a respective model for each of a plurality of speech input terminals (100).

4. The apparatus according to claim 2, further compromising means for storing a respective quantization

table for each of a plurality of speech input terminals.

5. A speech communication method performed in a speech input terminal (100) that is used to transmit speech data to a speech recognition apparatus (200) through a wire or wireless communication network, the method comprising :

receiving (S412) speech data from a speech input means (101);
creating (S405) a model based on information that represents an operation environment, the model being for environment adaptation for speech recognition in said speech recognition apparatus (200);
quantizing (S414) the speech data using a quantization table received from said speech recognition apparatus (200); and
transmitting (S406, S414) the model and the quantized speech data to said speech recognition apparatus (200).

6. A speech communication method performed in a speech recognition apparatus (200) that executes speech recognition processing for speech data transmitted from a speech input terminal (100) through a wire or wireless communication network (300), the method comprising:

receiving (S407) a model for environment adaptation for the speech recognition, the model being created by the speech input terminal (100) based on information representing an operation environment thereof;
creating (S409) a quantization table based on the model ;
transmitting (S410) the quantization table to said speech input terminal (100); and
executing (S415) speech recognition processing on the basis of the received model.

7. A storage medium storing computer implementable instructions for causing a programmable computer device to perform the method of claims 5 or 6.

8. A computer implementable instructions product for causing a programmable computer device to carry out the method of claims 5 or 6.

Patentansprüche

1. Spracheingabeendgerät (100) zum Übertragen von Sprachdaten zu einer Spracherkennungsvorrichtung (200) durch ein drahtgebundenes oder drahtloses Kommunikationsnetzwerk (300), mit:

einer Sprachempfangseinrichtung (103) zum Empfangen von Sprachdaten von einer Spracheingabeeinrichtung (101),
einer Erstellungseinrichtung (104) zum Erstellen eines Modells auf der Grundlage von Informationen, die eine Betriebsumgebung darstellen, wobei das Modell zur Umgebungsanpassung zur Spracherkennung in der Spracherkennungsvorrichtung (200) dient,
einer Einrichtung (105) zum Quantisieren der Sprachdaten unter Verwendung einer von der Spracherkennungsvorrichtung (200) empfangenen Quantisierungstabelle, und
einer Kommunikationseinrichtung zum Übertragen des Modells und der quantisierten Sprachdaten zu der Spracherkennungsvorrichtung (200).

2. Spracherkennungsvorrichtung (200) mit:

einer Spracherkennungseinrichtung (203) zum Ausführen einer Spracherkennungsverarbeitung von Sprachdaten, die von einem Spracheingabeendgerät (100) durch ein drahtgebundenes oder drahtloses Kommunikationsnetzwerk (300) übertragen sind, und
einer Einrichtung (202) zum Empfangen eines Modells zur Umgebungsanpassung für die Spracherkennung, wobei das Modell durch das Spracheingabeendgerät (100) auf der Grundlage von Informationen erstellt ist, die eine Betriebsumgebung dessen darstellen,

wobei die Spracherkennungseinrichtung (203) zum Ausführen einer Spracherkennungsverarbeitung auf der Grundlage des empfangenen Modells betreibbar ist,
die Vorrichtung (200) ferner mit:

einer Einrichtung (204) zum Erstellen einer Quantisierungstabelle auf der Grundlage des empfangenen Modells, und
einer Einrichtung (202) zum Übertragen der Quantisierungstabelle zu dem Spracheingabeendgerät (100).

3. Vorrichtung gemäß Anspruch 2, ferner mit einer Einrichtung zum Speichern eines jeweiligen Modells für jedes von einer Vielzahl von Spracheingabeendgeräten (100).

4. Vorrichtung gemäß Anspruch 2, ferner mit einer Einrichtung zum Speichern einer jeweiligen Quantisierungstabelle für jedes von einer Vielzahl von Spracheingabeendgeräten.

5. Sprachkommunikationsverfahren, das in einem Spracheingabeendgerät (100) durchgeführt wird, das zum Übertragen von Sprachdaten zu einer

Spracherkennungsvorrichtung (200) durch ein drahtgebundenes oder drahtloses Kommunikationsnetzwerk verwendet wird, wobei das Verfahren umfasst:

Empfangen (S412) von Sprachdaten von einer Spracheingabeeinrichtung (101),
Erstellen (S405) eines Modells auf der Grundlage von Informationen, die eine Betriebsumgebung darstellen, wobei das Modell zur Umgebungsanpassung zur Spracherkennung in der Spracherkennungsvorrichtung (200) dient,
Quantisieren (S414) der Sprachdaten unter Verwendung einer von der Spracherkennungsvorrichtung (200) empfangenen Quantisierungstabelle, und
Übertragen (S406, S414) des Modells und der quantisierten Sprachdaten zu der Spracherkennungsvorrichtung (200) .

6. Sprachkommunikationsverfahren, das in einer Spracherkennungsvorrichtung (200) ausgeführt wird, die eine Spracherkennungsverarbeitung für Sprachdaten ausführt, die von einem Spracheingabeendgerät (100) durch ein drahtgebundenes oder drahtloses Kommunikationsnetzwerk (300) übertragen sind, wobei das Verfahren umfasst:

Empfangen (S407) eines Modells zur Umgebungsanpassung für die Spracherkennung, wobei das Modell durch das Spracheingabeendgerät (100) auf der Grundlage von Informationen erstellt ist, die eine Betriebsumgebung dessen darstellen,
Erstellen (S409) einer Quantisierungstabelle auf der Grundlage des Modells,
Übertragen (S410) der Quantisierungstabelle zu dem Spracheingabeendgerät (100), und
Ausführen (S415) einer Spracherkennungsverarbeitung auf der Grundlage des empfangenen Modells.

7. Speichermedium, das computerimplementierbare Anweisungen zum Veranlassen einer programmierbaren Computereinrichtung zum Durchführen des Verfahrens gemäß Anspruch 5 oder 6 speichert.

8. Computerimplementierbares Anweisungsprodukt zum Veranlassen einer programmierbaren Computereinrichtung zum Ausführen des Verfahrens gemäß Anspruch 5 oder 6.

Revendications

1. Terminal d'entrée de parole (100) pour transmettre des données de parole à un appareil de reconnaissance de la parole (200) par l'intermédiaire d'un réseau de communication câblé ou sans fil (300), comprenant :

un moyen de réception de parole (103) pour recevoir des données de parole d'un moyen d'entrée de parole (101) ;
un moyen de création (104) pour créer un modèle sur la base d'informations qui représentent un environnement de fonctionnement, le modèle étant destiné à adapter à l'environnement la reconnaissance de la parole dans ledit appareil de reconnaissance de la parole (200) ;
un moyen (105) pour quantifier les données de parole en utilisant une table de quantification reçue dudit appareil de reconnaissance de la parole (200) ; et
un moyen de communication pour transmettre le modèle et les données de parole quantifiées audit appareil de reconnaissance de la parole (200).

2. Appareil de reconnaissance de la parole (200) comprenant :

un moyen de reconnaissance de la parole (203) pour exécuter un traitement de reconnaissance de la parole sur des données de parole transmises par un terminal d'entrée de parole (100) par l'intermédiaire d'un réseau de communication câblé ou sans fil (300) ; et
un moyen (202) pour recevoir un modèle pour adapter à l'environnement la reconnaissance de la parole, le modèle étant créé par le terminal d'entrée de parole (100) sur la base d'informations représentant son environnement d'exploitation,

dans lequel ledit moyen de reconnaissance de la parole (203) peut être mis en fonctionnement pour exécuter un traitement de reconnaissance de la parole sur la base du modèle reçu,
ledit appareil (200) comprenant en outre :

un moyen (204) pour créer une table de quantification sur la base du modèle reçu ; et
un moyen (202) pour transmettre la table de quantification audit terminal d'entrée de parole (100).

3. Appareil selon la revendication 2, comprenant en outre un moyen pour stocker un modèle respectif pour chacun d'une pluralité de terminaux d'entrée de parole (100).

4. Appareil selon la revendication 2, comprenant en outre un moyen pour stocker une table de quantification respective pour chacun d'une pluralité de terminaux d'entrée de parole.

5. Procédé de communication de parole effectué dans un terminal d'entrée de parole (100) qui est utilisé pour transmettre des données de parole à un appareil de reconnaissance de la parole (200) par l'intermédiaire d'un réseau de communication câblé ou sans fil, le procédé comprenant :

la réception (S412) de données de parole d'un moyen d'entrée de parole (101) ;
la création (S405) d'un modèle sur la base d'informations qui représentent un environnement d'exploitation, le modèle étant destiné à adapter à l'environnement la reconnaissance de la parole dans ledit appareil de reconnaissance de la parole (200) ;
la quantification (S414) des données de parole en utilisant une table de quantification reçue dudit appareil de reconnaissance de la parole (200) ; et
la transmission (S406, S414) du modèle et des données de parole quantifiées audit appareil de reconnaissance de la parole (200).

6. Procédé de communication de parole effectué dans un appareil de reconnaissance de la parole (200) qui exécute un traitement de reconnaissance de la parole sur des données de parole transmises par un terminal d'entrée de parole (100) par l'intermédiaire d'un réseau de communication câblé ou sans fil (300), le procédé comprenant :

la réception (S407) d'un modèle destiné à adapter à l'environnement la reconnaissance de la parole, le modèle étant créé par le terminal d'entrée de parole (100) sur la base d'informations représentant son environnement d'exploitation ;
la création (S409) de la table de quantification sur la base du modèle ;
la transmission (S410) de la table de quantification audit terminal d'entrée de parole (100) ; et
l'exécution (S415) du traitement de reconnaissance de la parole sur la base du modèle reçu.

7. Support de stockage stockant des instructions pouvant être mise en oeuvre sur ordinateur pour faire en sorte qu'un dispositif informatique programmable exécute le procédé de la revendication 5 ou 6.

8. Produit à base d'instructions exécutables par ordinateur pour faire en sorte qu'un dispositif informatique programmable mette en oeuvre le procédé de la revendication 5 ou 6.

FIG. 1

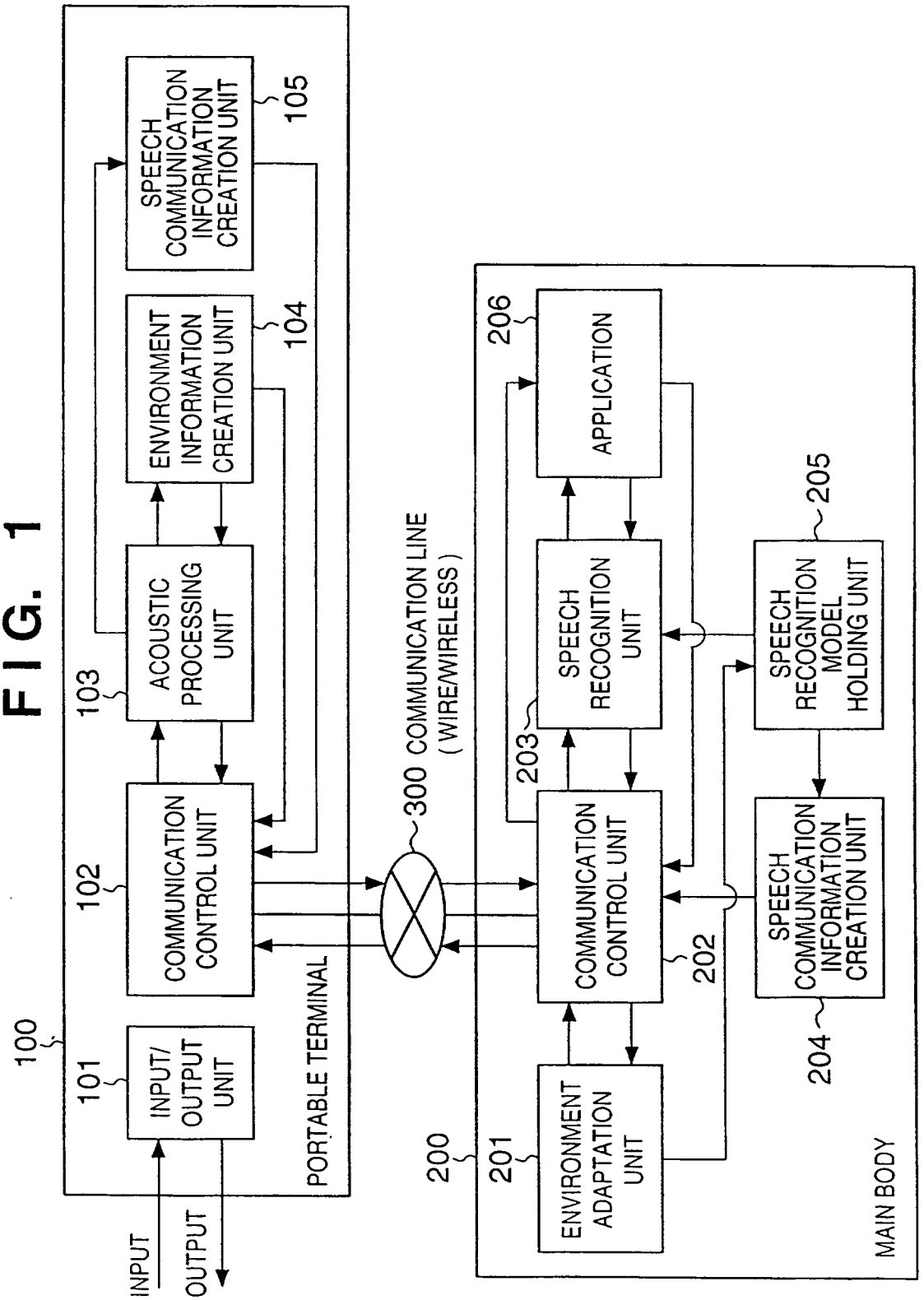
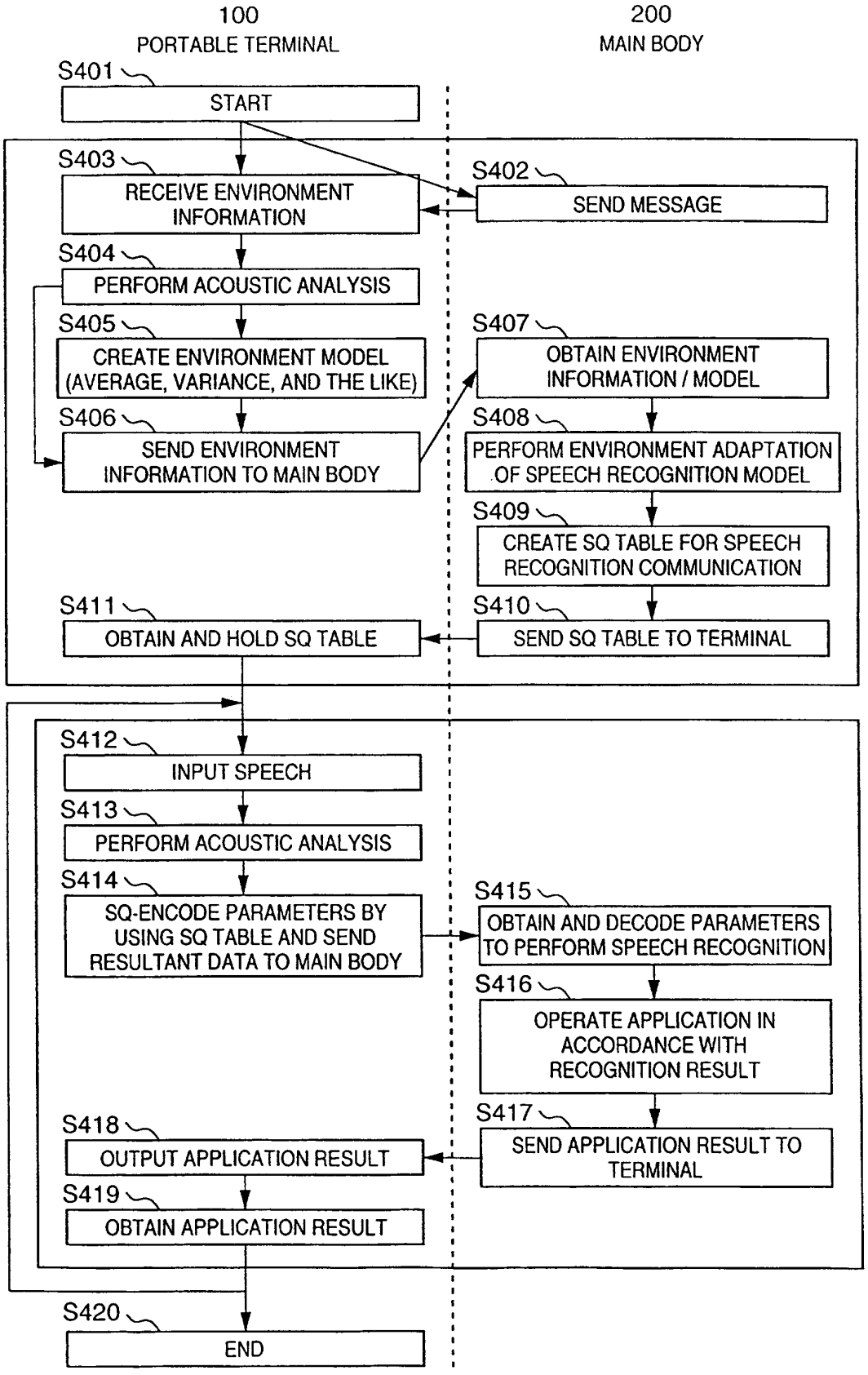

100
PORTABLE TERMINAL
101
INPUT/
OUTPUT
UNIT
102
COMMUNICATION
CONTROL UNIT
103
ACOUSTIC
PROCESSING
UNIT
104
ENVIRONMENT
INFORMATION
CREATION UNIT
105
SPEECH
COMMUNICATION
INFORMATION
CREATION UNIT
INPUT
OUTPUT
300 COMMUNICATION LINE
(WIRE/WIRELESS)
200
MAIN BODY
201
ENVIRONMENT
ADAPTATION
UNIT
202
COMMUNICATION
CONTROL UNIT
203
SPEECH
RECOGNITION
UNIT
204
SPEECH
COMMUNICATION
INFORMATION
CREATION UNIT
205
SPEECH
RECOGNITION
MODEL
HOLDING UNIT
206
APPLICATION

FIG. 2


100
PORTABLE TERMINAL
200
MAIN BODY
S401
START
S403
RECEIVE ENVIRONMENT INFORMATION
S402
SEND MESSAGE
S404
PERFORM ACOUSTIC ANALYSIS
S405
CREATE ENVIRONMENT MODEL (AVERAGE, VARIANCE, AND THE LIKE)
S407
OBTAIN ENVIRONMENT INFORMATION / MODEL
S406
SEND ENVIRONMENT INFORMATION TO MAIN BODY
S408
PERFORM ENVIRONMENT ADAPTATION OF SPEECH RECOGNITION MODEL
S409
CREATE SQ TABLE FOR SPEECH RECOGNITION COMMUNICATION
S411
OBTAIN AND HOLD SQ TABLE
S410
SEND SQ TABLE TO TERMINAL
S412
INPUT SPEECH
S413
PERFORM ACOUSTIC ANALYSIS
S414
SQ-ENCODE PARAMETERS BY USING SQ TABLE AND SEND RESULTANT DATA TO MAIN BODY
S415
OBTAIN AND DECODE PARAMETERS TO PERFORM SPEECH RECOGNITION
S416
OPERATE APPLICATION IN ACCORDANCE WITH RECOGNITION RESULT
S417
SEND APPLICATION RESULT TO TERMINAL
S418
OUTPUT APPLICATION RESULT
S419
OBTAIN APPLICATION RESULT
S420
END